



General Certificate of Secondary Education
2013–2014

Double Award Science: Chemistry

Unit C1

Foundation Tier

[GSD21]

ML

THURSDAY 15 MAY 2014, MORNING

Centre Number

71

Candidate Number

TIME

1 hour, plus your additional time allowance.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper.
Answer **all ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question 5.
A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper.

| For Examiner's use only | |
|-------------------------|-------|
| Question Number | Marks |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| Total Marks | |

- 1 A list of substances and their uses is shown below.
Draw a line from each substance to the correct use.

| Substance | Use |
|-----------------------------|--------------------------------------|
| anhydrous copper sulfate | chemical test for water |
| magnesium | test for an alkali |
| blue litmus paper | test for an acid |
| copper | cutting tool |
| diamond | high strength alloys for aircraft |
| | electrical wiring |

[5]

| Examiner Only | |
|---------------|--------|
| Marks | Remark |
| | |

2 Iodine is a solid at room temperature. It changes to a gas when heated.

(a) What is the name given to the change of state from solid to gas?

_____ [1]

(b) Look at the table below. Choose **one** other property of solid iodine and **one** other property of iodine gas.

Place a tick (✓) in both of the correct places in the table.

| Property | Iodine | |
|--|--------|-----|
| | Solid | Gas |
| has a fixed shape | ✓ | |
| takes the shape of the bottom of the container | | |
| takes the volume and shape of the container | | |
| can be compressed easily | | ✓ |
| cannot be compressed easily | | |

[2]

(c) What is the name of the Group in the Periodic Table where iodine is placed?

_____ [1]

Examiner Only

Marks Remark

3 Hydrated copper(II) sulfate is added to a beaker of water and stirred until some solid copper(II) sulfate remains at the bottom of the beaker.

(a) What colour is hydrated copper(II) sulfate?

_____ [1]

(b) Explain what is meant by the word **hydrated**.

_____ [1]

(c) Draw a labelled diagram with assembled apparatus to show how the solid copper(II) sulfate, which is left at the bottom of the beaker, is separated from the solution.

[4]

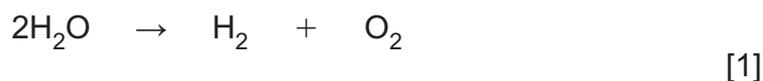
| Examiner Only | |
|---------------|--------|
| Marks | Remark |
| | |

4 When electricity is passed through water containing some acid, the water decomposes (breaks down) to form the gases hydrogen and oxygen.

(a) What is the name given to the process of decomposing a compound using electricity?

_____ [1]

(b) **Balance** the equation below which describes the decomposition of water.



(c) Describe a test for hydrogen gas.

 _____ [2]

(d) (i) Hydrogen is a **flammable** gas. Which **one** of the hazard symbols would be put on a cylinder of hydrogen gas?
 Put a circle round the correct hazard symbol.



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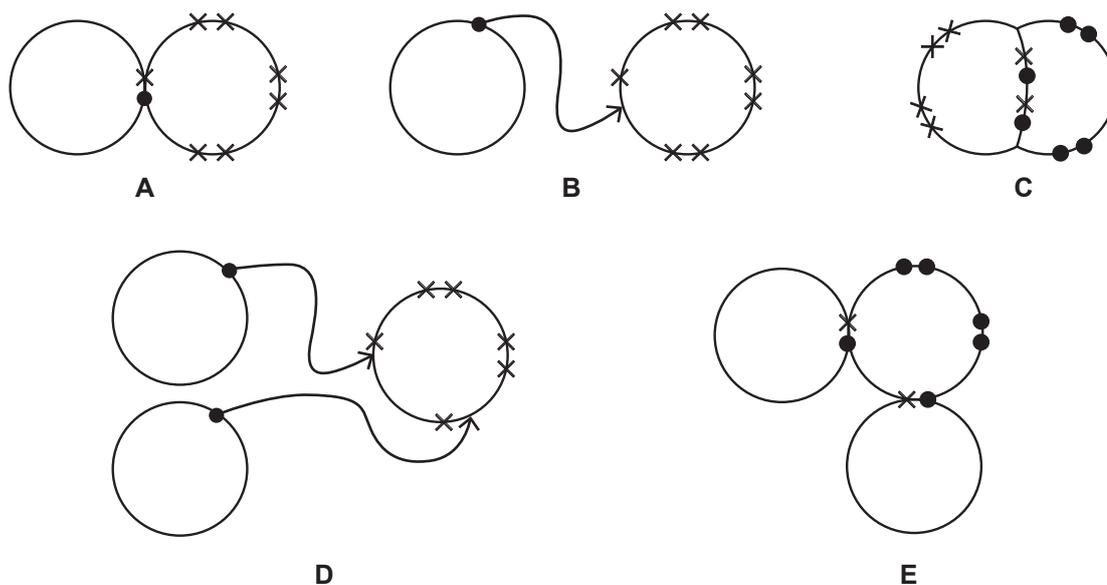
(ii) Write down two reasons why hazard symbols are important.

1. _____

 2. _____
 _____ [2]

| Examiner Only | |
|---------------|--------|
| Marks | Remark |
| | |

- 6 Five bonding diagrams, A–E, are drawn below. **Outer electrons are shown.**



- (a) Which diagram, **A**, **B**, **C**, **D** or **E**, is a dot and cross diagram of a substance with one single covalent bond?

_____ [1]

- (b) (i) Which diagram, **A**, **B**, **C**, **D** or **E**, could show the transfer of electrons between atoms of sodium and oxygen to form the ionic compound sodium oxide?

_____ [1]

- (ii) What is the name of the type of particles formed when electrons are **transferred** between atoms? Put a circle round the correct answer in the list below.

neutrons

allotropes

ions

isotopes

[1]

- (c) Which diagram, **A**, **B**, **C**, **D** or **E**, could show the covalent bonding between atoms of hydrogen and chlorine in hydrogen chloride?

_____ [1]

- (d) Which diagram, **A**, **B**, **C**, **D** or **E**, could show the sharing of electrons in a molecule of oxygen?

_____ [1]

Examiner Only

Marks Remark

7 Potassium is a soft metal that can be cut with a knife. It reacts violently with chlorine to form potassium chloride.

- (a) Complete and balance the symbol equation below for the reaction of potassium with chlorine.



- (b) Describe the appearance of a piece of freshly cut potassium.

_____ [1]

- (c) What happens to the freshly cut potassium when it is left in the air for a few minutes?

_____ [1]

- (d) Why is potassium stored under oil in the laboratory?

_____ [1]

- (e) Before reacting Group 1 elements with water a risk assessment is carried out.
Wearing safety glasses is one safety precaution that must be included in the risk assessment.

Write down two other safety precautions

1. _____ [2]

2. _____

Examiner Only

Marks

Remark

- (f) Equal sized pieces of three Group 1 metals are added to separate troughs of water that contain universal indicator. The observations made are recorded in the table below.

| Name of Group 1 metal | Observation when the metal is added to water | Colour of universal indicator |
|-----------------------|--|---|
| potassium | <ul style="list-style-type: none"> catches fire burns with a lilac flame on the surface of the water quickly disappears | <ul style="list-style-type: none"> changes colour from green to blue |
| lithium | <ul style="list-style-type: none"> floats moves about the surface of the water eventually disappears | <ul style="list-style-type: none"> changes colour from green to blue |
| sodium | <ul style="list-style-type: none"> melts into a silvery ball on the surface of the water disappears | <ul style="list-style-type: none"> changes colour from green to blue |

Read the information in the table carefully.

- (i) What happens to the reactivity of the Group 1 elements as the Group is descended? You may find your Data Leaflet helpful.

_____ [1]

- (ii) Explain fully why the universal indicator changed colour from green to blue.

 _____ [3]

- (iii) Write down one more observation which could be added to the table for **all three** reactions.

_____ [1]

- (iv) Write a **word** equation to describe the reaction between sodium and water.

_____ [2]

Examiner Only

Marks Remark

8 Mendeleev was one of the scientists involved in the development of the Periodic Table.

(a) He put elements that reacted in a similar way into Groups. Explain what is meant by the word **element**.

_____ [1]

Finish the sentence below.

(b) In his Periodic Table, Mendeleev arranged the elements in order of increasing _____ . [1]

(c) The table below gives some information about two elements in Group 5 of the Periodic Table. Fill in the missing information.

| Name | Symbol | Metal/Non-metal |
|------------|--------|-----------------|
| phosphorus | | |
| | Bi | |

[2]

(d) Nitrogen is also a Group 5 element. What Period is nitrogen in?

Period _____ [1]

(e) Element X has an electronic configuration 2, 8, 7. Explain why it is **not** an element in Group 5 of the Periodic Table.

 _____ [2]

Examiner Only

Marks Remark

- (e) A solution of 0.05 mol/dm^3 acid Y was tested using a pH meter and universal indicator paper. The results are recorded in the table below.

| Test | Result |
|---------------------|------------------|
| pH meter | pH = 3.03 |
| Universal indicator | orange pH = 3 |

- (i) Explain how the colour of universal indicator is used to give a pH value.

_____ [1]

- (ii) How do the results show that acid Y is a weak acid?

_____ [1]

- (iii) Write down one example of a weak acid.

_____ [1]

- (iv) Which property of the acid is measured in the units mol/dm^3 ?
Put a circle round the correct answer.

mass

volume

concentration

strength

[1]

Examiner Only

Marks

Remark

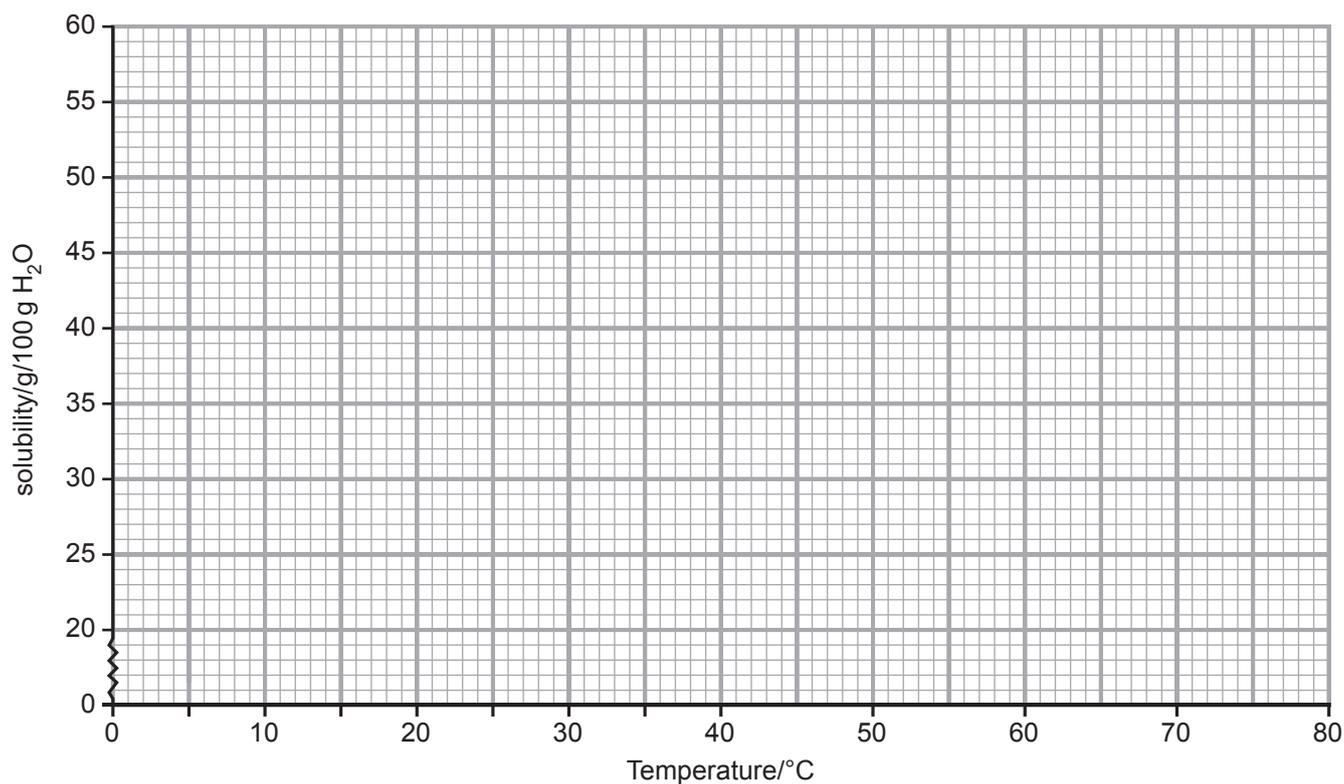
- 10 (a) An investigation was carried out to find the solubility (g/100 g H₂O) of potassium chloride at different temperatures. The results are given in the table below.

| Temperature (°C) | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 80 |
|---------------------------------------|------|------|------|------|------|------|------|------|
| Solubility (g/100 g H ₂ O) | 27.8 | 30.9 | 34.0 | 37.1 | 40.0 | 42.9 | 45.8 | 51.2 |

- (i) At 70 °C, 12.1 g of potassium chloride will saturate 25 g of water. Calculate the solubility of potassium chloride at 70 °C. (You must show your working out.)

_____ g/100 g H₂O [1]

- (ii) Draw the solubility curve for potassium chloride. Draw this on the grid below. [3]



| Examiner Only | |
|---------------|--------|
| Marks | Remark |
| | |

- (b) Look at the table below. It gives the solubility (g/100 g H₂O) at different temperatures for four **solid** compounds, A, B, C and D.

| Solid | Solubility (g/100 g H ₂ O) | | | | | | |
|-------|---------------------------------------|-------|-------|-------|-------|-------|-------|
| | 0 °C | 10 °C | 20 °C | 30 °C | 40 °C | 60 °C | 80 °C |
| A | 60.0 | 66.7 | 73.9 | 81.8 | 88.7 | 106.0 | 132.0 |
| B | 12.3 | 16.4 | 18.6 | 25.0 | 31.6 | 40.4 | 49.0 |
| C | 0.22 | 0.24 | 0.25 | 0.26 | 0.26 | 0.24 | 0.23 |
| D | 79.2 | 85.4 | 94.2 | 105.0 | 119.0 | 158.0 | 187.0 |

- (i) Use the data in the table to complete the following general rule.

For most solids the solubility _____ as the temperature _____.

[1]

- (ii) One of the compounds in the table does not follow this solubility rule.

Describe fully what happens to the solubility of this solid as the temperature is increased from 0 °C to 80 °C.

_____ [2]

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|---------------|--------|
| Marks | Remark |
| | |

THIS IS THE END OF THE QUESTION PAPER

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